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**ABSTRACT**

This framework document is the result of an extensive review of information on technology curricula from around the globe--with a focus on the work being done by Canadian education ministries, state and foreign education ministries and school jurisdictions. It is also the result of consultations with Alberta employers, employees, parents, teachers and community members on the knowledge and skills students should be able to demonstrate when leaving high school. The document highlights technology learner outcomes for ECS to Grade 12 students. It identifies outcomes already included in current programs of study, and attempts to anticipate the knowledge, skills, and attitudes that students will need to develop in the future as technology continues to change. This curriculum framework provides a foundation for: (1) helping Alberta Education, school systems, and schools to identify or place the outcomes in appropriate grades and subject areas; (2) developing illustrative examples--tasks that students can complete to demonstrate their proficiency--accompanied by criteria and standards of performance; (3) producing learning resources for students and teachers--guides, suggested instructional strategies, student materials, assessment tools; and (4) planning professional development activities. This document includes a glossary of terms. (Contains 11 references.) (JAK)

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The primary intended audience for this framework is:

<i>Administrators</i>	✓
<i>Counsellors</i>	
<i>General Audience</i>	✓
<i>Parents</i>	✓
<i>Students</i>	
<i>Teachers</i>	✓

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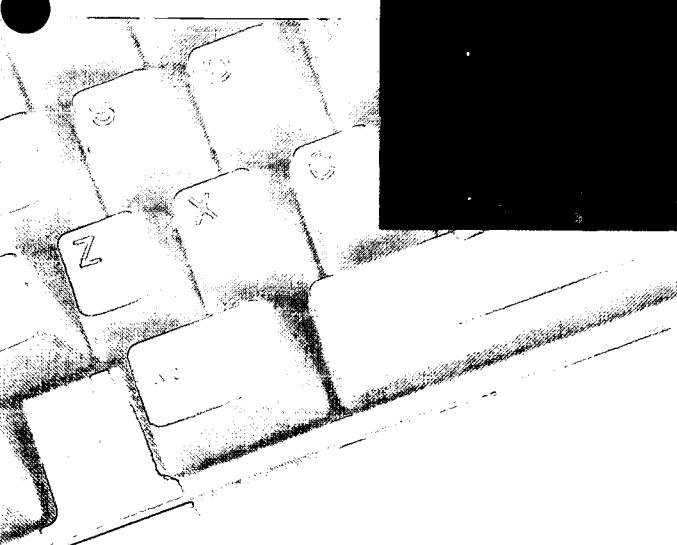
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ED 416 854



LEARNER OUTCOMES IN  
INFORMATION AND COMMUNICATION  
TECHNOLOGY

ECS TO GRADE 12



A FRAMEWORK

for Information and Communication Technology

Learning Outcomes for Students

Learning Outcomes for Teachers

Learning Outcomes for Schools

Learning Outcomes for Parents

Learning Outcomes for Communities

Learning Outcomes for Society

Learning Outcomes for the Environment

Learning Outcomes for the Economy

Learning Outcomes for the Future

Learning Outcomes for the World

Learning Outcomes for the Universe

Learning Outcomes for the Multiverse

Learning Outcomes for the Multimultiverse

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LEARNER OUTCOMES IN  
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ECS TO GRADE 12



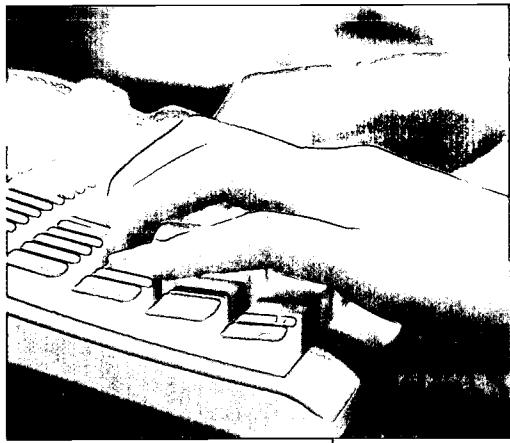
A FRAMEWORK

OCTOBER 1997

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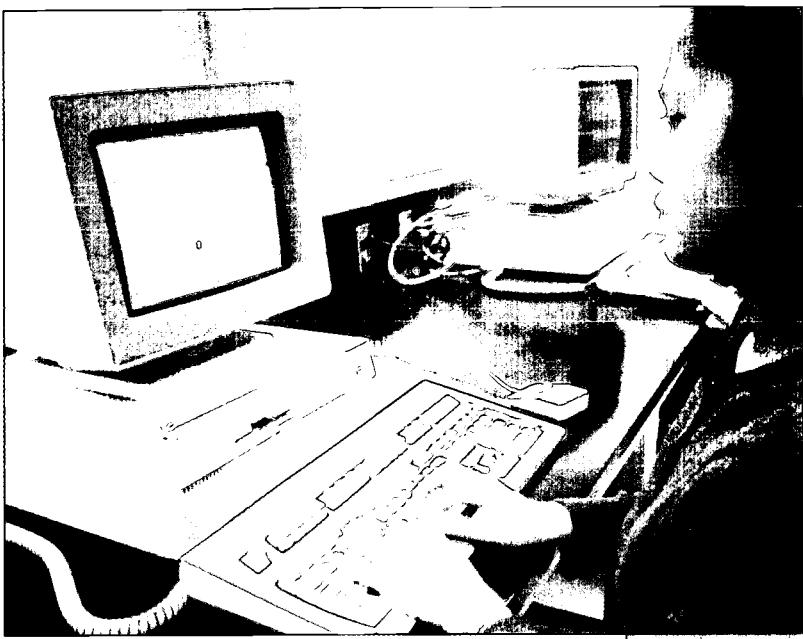


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## INTRODUCTION

*With respect to technology, students should have knowledge, skills and attitudes that will serve them well for entry-level work, for further study and for lifelong learning, and that will serve them well as they strive to become inquisitive, reflective, discerning and caring persons.*



## BACKGROUND

One of the distinguishing characteristics of human beings is our ability to make extensive use of tools and develop processes that make our lives easier. In earlier times, we found better ways to cook, hunt, gather food and travel. The technologies involved were primitive by today's standards, but they were nonetheless extremely important. They ensured our success and even our very existence.

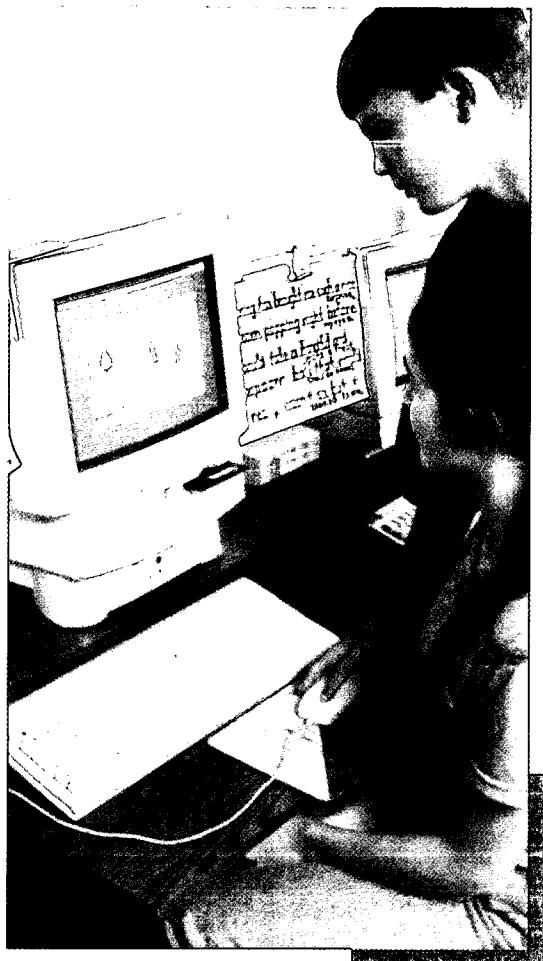
We are still developing technologies that have significant effects on our daily lives: technologies associated with the mass production of goods and services, global communication and lifesaving medical procedures, and technologies for use in industry, recreation, transportation and education. As well, some of our new technologies have the potential to threaten our existence and invade our privacy. Nuclear arms, chemical warfare, land mines and electronic surveillance come to mind.

Technology is more pervasive today than it has ever been. A whole array of tools, techniques and processes are enhancing and altering human activity. Technologies are enabling us to live, work and think in ways that most of us never dreamed were possible. For example, we now have access to "just-in-time delivery," asynchronous communication such as voice mail and e-mail, personalized services, virtual offices and schools, quality assurance processes, zero defects, and "push" technologies.

## DEVELOPING A FRAMEWORK FOR LEARNING

Technology has given us a capacity to provide education and training at any place, any time, to anyone and in a variety of modes. Technology is causing the process of schooling to undergo phenomenal changes — both in the methods of delivery and in how people actually learn and teach.

The prominent role of technology in our lives today is also changing curricula, that is, *what* students learn. As always, young people need



*Today, students must be prepared to understand, use and apply technologies in effective, efficient and ethical ways.*

to acquire specific knowledge, skills and attitudes in order to become self-reliant, responsible, caring and contributing members of society. However, what they need to know and be able to do is constantly changing. Keeping curricula current is therefore an essential aspect of preparing students for the workplace, post-secondary studies, lifelong learning and citizenship in a complex world.

Today, students must be prepared to understand, use and apply technologies in effective, efficient and ethical ways. High school graduates will be expected to be able to use information, communication and multimedia technologies.

To begin addressing these needs and expectations, Alberta Education asked the question, "What should Alberta students be learning with respect to technology?" In general terms, schools ensure that students are able to become productive citizens and contributing members of our society. With respect to technology, students should have knowledge, skills and attitudes that will serve them well for entry-level work, for further study and for lifelong learning, and that will help them become inquisitive, reflective, discerning and caring persons.

Alberta Education has conducted an extensive review of information on technology curricula from around the globe — with a focus on the work being done by Canadian education ministries, state and foreign education ministries and school jurisdictions. We also consulted with Alberta employers, employees, parents, teachers and community members on the knowledge and skills students should be able to demonstrate when leaving high school.

This framework document is the result of our research and consultations. This document highlights technology learner outcomes for ECS to Grade 12 students in Alberta. It identifies not only the outcomes that are already included in current programs of study, but also anticipates the knowledge, skills and attitudes that students will need to develop in the future as technology continues to change and grow. This is a "curriculum within a curriculum" — a cross section of technology outcomes that become essential components of subject-specific outcomes.

This technology framework provides a broad perspective on the nature of technology and its effect on society. Students are encouraged to grapple with the complexities and the advantages and disadvantages of technologies in our lives and workplaces.

This curriculum framework provides a foundation for

- helping Alberta Education, school systems and schools to identify or place the outcomes in appropriate grades and subject areas
- developing illustrative examples — tasks that students can complete to demonstrate their proficiency — accompanied by criteria and standards of performance
- producing learning resources for students and teachers — guides, suggested instructional strategies, student materials, assessment tools
- planning professional development activities

## UNDERLYING PRINCIPLES

**The technology outcomes in this framework are limited to basic constructs relating primarily to information, communication and multimedia technologies.**

**Most students should learn and be able to demonstrate the technology outcomes included in this framework.**

**The technology outcomes are framed as *exit outcomes*, that is, outcomes that students will be expected to demonstrate by the end of divisions 1, 2, 3 and 4.**

**The outcomes are *progressive*: simple skills lead into more complex skills.**

**The technology outcomes reflect knowledge, skills and attitudes that are *integrated* and applied within the context of most programs of study.**

**DISCUSSION:** Technology in its broadest sense includes all the processes, tools and techniques that alter human activity. The scope of this work is limited to information, communication and multimedia technologies which embody essential learnings for a student's future development.

**DISCUSSION:** Although the outcomes are designed for all students, some students will have individual program plans (IPPs) that modify the expectations. Students who have physical or mental disabilities will need to use specific technologies that help them communicate, be mobile and/or help them learn. Students also may choose to further advance their technology knowledge and skills through courses such as those offered in Career and Technology Studies.

**DISCUSSION:** The framework identifies the placement of the outcomes within divisions (Division I: Grades 1–3; Division II: Grades 4–6; Division III: Grades 7–9; Division IV: Grades 10–12). A Curriculum Integration Guide will recommend grade and subject placements.

**DISCUSSION:** Outcomes identified at early grade levels are not repeated in the text of the framework, but it is assumed that these outcomes will be maintained and demonstrated through more complex applications.

**DISCUSSION:** The technology outcomes are, in many instances, already embedded in a number of programs of study, such as language arts, mathematics, science, social studies and Career and Technology Studies (CTS). Technology is being applied in many learning situations. For example, students are expected to use graphing calculators, word processors, problem-solving strategies or brainstorming techniques to accomplish specified tasks. Students are demonstrating technological proficiency as they apply a variety of technology skills or knowledge within programs. The context of the subject matter provides definition or clarification of the specific technology outcome.

## FRAMEWORK OVERVIEW



### ORGANIZATION

The outcomes presented here

- are intended to be integrated in a variety of existing programs. Each of the outcomes needs a context to be meaningful. The development of word-processing skills, for example, should be addressed within the context of communication. An integration chart is being developed to illustrate existing placements by grade or subject
- should be introduced at appropriate grade levels and subject areas, in keeping with the developmental readiness of students
- are described in developmental sequences through the four divisions—students should be asked to demonstrate their competencies at various points along the way
- should be considered holistically: the overall impact of instruction comes from the sum of the knowledge, skills and attitudes taken together
- have been written, to the extent that it is possible, as concepts as well as specific skills—concepts that can be related to new applications as they evolve

This framework presents the outcomes in three interrelated categories. First, there is a **foundation** of knowledge, skills and attitudes; it becomes more sophisticated as a student matures and grows. Second, there is a set of outcomes that address specific **processes for productivity**, such as composing, communicating and organizing data. Third, these processes are then **applied** to give practical, contextualized experience in inquiring, decision making and problem solving.

#### The Three Key Categories are:

##### **Foundational Operations, Knowledge and Concepts**

The **foundational operations, knowledge and concepts** outcomes include understanding the nature and impact of technology, the moral and ethical use of technology, mass media in a digitized context, ergonomic and safety issues, and basic computer, telecommunication and multimedia technology operations.

##### **Processes for Productivity**

The **processes for productivity** outcomes focus on the knowledge and skills required to use a variety of basic productivity techniques and tools. These include text composition, data organization, media and process integration, electronic communication navigation, collaboration through electronic means, and graphical, audio and multimedia composition and manipulation.

##### **Inquiring, Decision-making and Problem-solving**

The **inquiring, decision-making and problem-solving** outcomes build on the foundational operations, knowledge and concepts, as well as the ability to use a variety of processes. These outcomes include the ability to critically assess information, manage inquiry, solve problems and use research techniques. These outcomes should be addressed within the context of such subjects as language arts, mathematics, social studies and science. Students should be expected to apply their knowledge and skills in practical situations.

*The outcomes presented are intended to be integrated within existing programs.*

*Each of the outcomes needs a context within which to become meaningful.*



## OUTCOMES

There are two levels of outcomes: general and specific. The general outcomes are outcomes of "significance"; that is, they describe complex concepts and skills. The general outcomes specify domains of learning. Specific outcomes are provided to illustrate what is entailed in the general outcomes. Specific outcomes need to be addressed within the context of the related general outcome.

- **General Outcomes** are statements identifying what students are expected to know and be able to do upon completion of an exit level.
- **Specific Outcomes** are statements identifying the component knowledge, skills and attitudes of a general outcome. Specific outcomes will be supported by a set of **illustrative examples**.

**Illustrative Examples** will demonstrate and elaborate on the general and specific outcomes. They are important in further clarifying the intent of the outcomes and in conveying how students might demonstrate their competencies in a variety of contexts and across all grade levels and all subject areas.

*A set of illustrative examples is scheduled to be available by June 1998.*

## IMPLEMENTATION AND TIMELINES

*Teachers will want to integrate the learning outcomes in technology into their instructional and assessment plans.*



### CURRICULUM INTEGRATION

A draft curriculum integration guide is in development. This guide

- identifies the technology outcomes that already exist in various programs of study
- suggests subject and grade level placements for the outcomes

Schools or school jurisdictions may wish to develop their own integration guides.

### IMPLEMENTATION

Best Practice projects are in development to identify models of implementation and curricular integration. Some jurisdictions have already begun the process of implementation, including inservices for teachers, curriculum integration and resource identification. The work of these jurisdictions, schools and teachers will be described and shared in the technology section of the Alberta Education web site (<http://ednet.edc.gov.ab.ca>).

### PROFESSIONAL DEVELOPMENT

The learner outcomes in technology provide the basis for professional development activities for teachers. Teachers will want to integrate the learner outcomes in technology into their instructional and assessment plans. Many school systems and schools have conducted inservice sessions on technology already; the learner outcomes will help focus the goals of these sessions.

### TIMELINES

Draft Curriculum Integration Guide	December 1997
Draft Illustrative Examples for field review	December 1997
Curriculum Integration Guide with Illustrative Examples	June 1998
Interim Technology Program of Studies	June 1998
Provincial Technology Program of Studies	June 2000

# LEARNER OUTCOMES IN INFORMATION AND COMMUNICATION TECHNOLOGY

## *ORGANIZER F      Foundational Operations, Knowledge and Concepts*

---

- F1. Students will demonstrate an understanding of the nature of technology.
- F2. Students will understand the role of technology as it applies to self, work and society.
- F3. Students will demonstrate a moral and ethical approach to the use of technology.
- F4. Students will become discerning consumers of mass media and electronic information.
- F5. Students will practice the concepts of ergonomics and safety when using technology.
- F6. Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.

## *ORGANIZER P      Processes for Productivity*

---

- P1. Students will compose, revise and edit text.
- P2. Students will organize and manipulate data.
- P3. Students will communicate through multimedia.
- P4. Students will integrate various applications.
- P5. Students will navigate and create hyperlinked resources.
- P6. Students will use communication technology to interact with others.

## *ORGANIZER I      Inquiry, Decision Making and Problem Solving*

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- I1. Students will access and use information from a variety of technologies.
- I2. Students will seek alternative viewpoints using information technologies.
- I3. Students will critically assess information accessed through the use of a variety of technologies.
- I4. Students will use organizational processes and tools to manage inquiry.
- I5. Students will use technology to aid collaboration during inquiry.
- I6. Students will use technology to investigate and/or solve problems.
- I7. Students will use electronic research techniques to construct personal knowledge and meaning.

## *Foundational Operations, Knowledge and Concepts*

### **F1. Students will demonstrate an understanding of the nature of technology.**

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 identify techniques and tools for communicating, storing, retrieving and selecting information	2.1 apply terminology appropriate to the technologies being used at this division level	3.1 demonstrate an understanding that information can be transmitted through a variety of media	4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems
1.2 apply terminology appropriate to the technologies being used at these grade levels	2.2 identify and apply techniques and tools for communicating, storing, retrieving and selecting information	3.2 explain the concept of software and hardware compatibility	4.2 solve scientific and mathematical problems by selecting appropriate technology to perform experiments and calculations
1.3 demonstrate an understanding that the user manages and controls the outcomes of technology	2.3 explain the advantages and limitations of using computers to store, organize, retrieve and select information	3.3 apply terminology appropriate to the technology being used at this division level	4.3 apply terminology appropriate to technology in all forms of communication
	2.4 recognize the potential for human error when using technology	3.4 demonstrate an understanding that digital technology follows a logical order of operations	4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems
		3.5 explain the difference between digital and analog data on communication systems	
		3.6 explain how the need for global communication will affect technology around the world	
		3.7 demonstrate the ability to troubleshoot technical problems	
		3.8 demonstrate an understanding that technology is a process, technique or tool used to alter human activity	

## *Foundational Operations, Knowledge and Concepts*

### **F2. Students will understand the role of technology as it applies to self, work and society.**

Division 1	Division 2	Division 3	Division 4
	The student will be able to	The student will be able to	The student will be able to
1.1 identify technologies used in everyday life	2.1 identify how technological developments influence his or her life	3.1 describe the impact of communication technologies on past, present and future workplaces, lifestyles and the environment	4.1 use technology outside formal classroom settings
1.2 describe particular technologies being used for specific purposes	2.2 identify the role technology plays in a variety of careers	3.2 identify potential technology-related career paths	4.2 analyze how technological innovations and creativity affect the economy
	2.3 examine the environmental issues related to the use of technology	3.3 identify the cultural impact of global communication	4.3 demonstrate an understanding of new and emerging communication systems
	2.4 assess the personal significance of having limitless access to information provided by communication networks such as the Internet	3.4 evaluate the driving forces behind various technological inventions	4.4 evaluate possible potential for emerging technologies
	2.5 describe, using examples, how communication and information networks such as the telephone and the Internet create a global community	3.5 make inferences regarding future trends in the development and impact of communication technologies	4.5 demonstrate conservation measures when using technology
		3.6 explain ways in which technology can assist in the monitoring of local and global environmental conditions	4.6 demonstrate the consumer knowledge necessary to make purchases such as a computer, modem, VCR and video camera
		3.7 analyze and assess the impact on society of having limitless access to information	4.7 use current, reliable information sources from around the world
		3.8 identify the manner in which telecommunications technology affects time and distance	4.8 analyze and assess the impact of technology on the global community

## *Foundational Operations, Knowledge and Concepts*

### **F3. Students will demonstrate a moral and ethical approach to the use of technology.**

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 demonstrate courtesy and follow classroom procedures when making appropriate use of computer technologies	2.1 comply with the acceptable use policy of the school and district for Internet and networked services, including software licensing agreements	3.1 use time and resources on the network wisely	4.1 demonstrate an understanding of how changes in technology can benefit or harm society
1.2 work collaboratively to share limited resources	2.2 work collaboratively to share limited resources	3.2 explain the issues involved in balancing the right to access information with the right to personal privacy	4.2 record relevant data for acknowledging sources of information and cite sources correctly
1.3 demonstrate appropriate care of technology equipment	2.3 use appropriate communication language and etiquette	3.3 understand the need for copyright legislation	4.3 respect ownership and integrity of information
1.4 recognize and acknowledge the ownership of electronic material	2.4 document sources obtained electronically such as Web site addresses	3.4 cite sources when using copyright and/or public domain material	
1.5 use appropriate communication etiquette	2.5 respect the privacy and products of others	3.5 download and transmit only materials that comply with the established network use policies and practices	
	2.6 use electronic networks in an ethical manner	3.6 model and assume personal responsibility for ethical behaviour and attitudes and acceptable use of information technologies and sources in local and global contexts	
	2.7 comply with copyright legislation		

## *Foundational Operations, Knowledge and Concepts*

### **F4. Students will become discerning consumers of mass media and electronic information.**

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 compare similar types of information from two different electronic sources	2.1 recognize that graphics, video and sound enhance communication	3.1 identify aspects of style in a presentation	4.1 discriminate between style and content in a presentation
	2.2 describe how the use of various texts and graphics can alter perception	3.2 understand the nature of various media and how they are consciously used to influence an audience	4.2 evaluate the influence and results of digital manipulation on our perceptions
	2.3 discuss how technology can be used to create special effects and/or to manipulate intent through the use of images and sound	3.3 identify specific techniques used by the media to elicit particular responses from users	4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication
		3.4 recognize that the ability of technology to manipulate images and sound can alter the meaning of a communication	

## *Foundational Operations, Knowledge and Concepts*

### **F5. Students will practice the concepts of ergonomics and safety when using technology.**

Division 1	Division 2	Division 3	Division 4
The student will be able to			
1.1 demonstrate proper posture when using a computer	2.1 demonstrate the application of ergonomics to promote personal health and well-being	3.1 identify risks to health and safety that result from improper use of technology	4.1 assess new physical environments with respect to ergonomics
1.2 demonstrate safe behaviours when using technology	2.2 identify and apply safety procedures required for the technology being used	3.2 identify and apply safety procedures required for the technology being used	4.2 identify safety regulations specific to the technology being used

## *Foundational Operations, Knowledge and Concepts*

**F6. Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.**

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 perform basic computer operations (which may vary by environment), including powering up, inserting disks, moving the cursor, clicking on an icon, using pull-down menus, executing programs, saving files, retrieving files, printing, ejecting disks and powering down	2.1 power up and power down various technologies and peripherals correctly 2.2 use and organize files and directories 2.3 use peripherals, including printers and scanners 2.4 use appropriate keyboarding techniques for the alphabetic and punctuation keys	3.1 connect and use audio, video and digital equipment 3.2 perform routine data maintenance and management of personal files 3.3 demonstrate proficiency in uploading and downloading text, image, audio and video files	4.1 continue to demonstrate the learner outcomes addressed within the previous divisions Students interested in pursuing advanced study in areas such as electronics, programming, CAD, robotics and other industrial applications of technology will find opportunities in CTS modules.
1.2 use keyboarding techniques for the home row, enter, space bar, tab, backspace, delete and insertion point arrow keys	1.3 operate basic audio and video equipment, including inserting, playing, recording and ejecting media	3.4 demonstrate the ability to electronically control devices 3.5 describe the steps involved in loading software 3.6 identify and apply safety procedures, including anti-virus scans and virus checks, to maintain data integrity	

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LEARNER OUTCOMES IN INFORMATION AND COMMUNICATION TECHNOLOGY

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## *Processes for Productivity*

### P1. Students will compose, revise and edit text.

Division 1	Division 2	Division 3	Division 4
<p>The student will be able to</p> <p>1.1 create original text, using word-processing software, to communicate and demonstrate understanding of forms and techniques</p> <p>1.2 edit, using such features of a word processor as cut, copy and paste, for complete sentences</p>	<p>The student will be able to</p> <p>2.1 create and revise original text to communicate and demonstrate understanding of forms and techniques</p> <p>2.2 edit and format text using such word-processing features as the thesaurus, find/change, text alignment, font size and style to clarify and enhance meaning</p> <p>2.3 convert digital text files by opening and saving them as different file types</p>	<p>The student will be able to</p> <p>3.1 design a document, using style sheets and with attention to page layout, that incorporates advanced word-processing techniques, including: headers, footers, margins, columns, bibliography, index, table of contents</p> <p>3.2 use advanced menu features within a word processor to accomplish a task, for example, insert a table, graph or text from another document</p>	<p>The student will be able to</p> <p>4.1 continue to demonstrate the learner outcomes achieved in prior grades and course subjects.</p>
		<p>3.3 revise text documents based on feedback from others</p> <p>3.4 use appropriate communication technology to elicit feedback from others</p>	

## *Processes for Productivity*

### P2. Students will organize and manipulate data.

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 read information from a prepared database	2.1 enter and manipulate data, by using tools such as a spreadsheet or database for a specific purpose	3.1 design, create and modify a database for a specific purpose	4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets
	2.2 display data electronically through graphs and charts	3.2 design, create and modify a spreadsheet for a specific purpose, using functions such as: SUM, PRODUCT, QUOTIENT, and AVERAGE	4.2 use programming tools such as macros, scripts and applets to modify or control a technological device

## Processes for Productivity

### P3. Students will communicate through multimedia.

Division 1	Division 2	Division 3	Division 4
The student will be able to		The student will be able to	The student will be able to
1.1 access images, such as clip art, to support communication	2.1 create a multimedia presentation, incorporating features such as visual images (clip art, video clips), sounds (live recordings, sound clips) and animated images, appropriate to a variety of audiences and purposes	3.1 create multimedia presentations that take into account audiences of diverse size, age, gender, ethnicity and geographic location	4.1 select and use, independently, multimedia capabilities for presentations in various subject areas
1.2 create visual images by using tools such as paint and draw programs for particular audiences and purposes	2.2 access available databases for images to support communication	3.2 create multimedia presentations that incorporate meaningful graphics, audio, video and text gathered from remote sources	4.2 support communication with appropriate images, sounds and music

Division 4  
The student will be able to

- 1.1 select and use, independently, multimedia capabilities for presentations in various subject areas
- 1.2 support communication with appropriate images, sounds and music
- 1.3 apply general principles of graphic layout and design to a document in process

## *Processes for Productivity*

### **P4. Students will integrate various applications.**

Division 1	Division 2	Division 3	Division 4
<p>The student will be able to</p> <ul style="list-style-type: none"><li>1.1 integrate text and graphics to form a meaningful message</li><li>1.2 balance text and graphics for visual effect</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>2.1 integrate a spreadsheet, or graphs generated by a spreadsheet, into a text document</li><li>2.2 vary font style and size, and placement of text and graphics, in order to create a certain visual effect</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>3.1 integrate information from a database into a text document</li><li>3.2 integrate database reports into a text document</li><li>3.3 emphasize information, using placement and colour</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience</li><li>4.2 apply principles of graphic design to enhance meaning and audience appeal</li><li>4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text</li></ul>

## *Processes for Productivity*

### **P5. Students will navigate and create hyperlinked resources.**

Division 1	Division 2	Division 3	Division 4
<p>The student will be able to</p> <ul style="list-style-type: none"><li>1.1 navigate within a document, compact disc or other software program that contains links</li><li>1.2 access hyperlinked sites on an intranet or the Internet</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>2.1 create and navigate a multiple-link document</li><li>2.2 navigate through a document that contains links to locate, copy and then paste data in a new file</li><li>2.3 navigate the Internet with appropriate software</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>3.1 create a multiple-link Web page</li><li>3.2 demonstrate proficient use of various information retrieval technologies</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>4.1 create multiple-link documents appropriate to the content of a particular topic</li><li>4.2 post multiple-link pages on the World Wide Web or on a local or wide area network</li></ul>

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## *Processes for Productivity*

### **P6. Students will use communication technology to interact with others.**

Division 1	Division 2	Division 3	Division 4
<p>The student will be able to</p> <ul style="list-style-type: none"><li>1.1 compose a message that can be sent through communication technology</li><li>1.2 communicate electronically with people outside the classroom</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>2.1 select and use the technology appropriate to a given communication situation</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>3.1 communicate with a targeted audience, within a controlled environment, by using communication technologies such as newsgroups and web browsers</li><li>3.2 demonstrate proficiency in accessing local area network, wide area network and Internet services, including uploading and downloading text, image, audio and video files</li></ul>	<p>The student will be able to</p> <ul style="list-style-type: none"><li>4.1 select and use the appropriate technologies to communicate effectively with a targeted audience</li></ul>

## *Inquiry, Decision Making and Problem Solving*

### II. Students will access and use information from a variety of technologies.

Division 1	Division 2	Division 3	Division 4
The student will be able to 1.1 access and retrieve appropriate information from electronic sources for a specific inquiry 1.2 process information from more than one source to retell what has been discovered	The student will be able to 2.1 access and retrieve appropriate information from the Internet by using a specific search path or given uniform resource locations (URLs) 2.2 organize information gathered from the Internet or an electronic source by selecting and recording the data in logical files or categories	The student will be able to 3.1 plan and conduct a search, using a wide variety of electronic sources 3.2 refine searches to limit sources to a manageable number 3.3 access and operate multimedia applications and technologies from stand-alone and online sources 3.4 access and retrieve information through the electronic network 3.5 analyze and synthesize information to create a product	The student will be able to 4.1 plan and perform complex searches using more than one electronic source 4.2 select information from appropriate sources, including primary and secondary sources 4.3 evaluate and explain the advantages and disadvantages of various search strategies

## *Inquiry, Decision Making and Problem Solving*

### 12. Students will seek alternative viewpoints using information technologies.

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
2.1 seek responses to inquiries from various authorities through electronic media	3.1 access diverse viewpoints on particular topics by using appropriate technologies	4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics	
	3.2 assemble and organize different viewpoints in order to assess their validity	4.2 evaluate the validity of gathered viewpoints against other sources	
	3.3 use information technology to find facts that support or refute diverse viewpoints		

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## *Inquiry, Decision Making and Problem Solving*

### **13. Students will critically assess information accessed through the use of a variety of technologies.**

Division 1	Division 2	Division 3	Division 4
The student will be able to	The student will be able to	The student will be able to	The student will be able to
1.1 compare and contrast information from similar types of electronic sources	2.1 identify and distinguish points of view expressed in electronic sources on a particular topic  2.2 recognize that information serves different purposes and data from electronic sources may need to be verified to determine accuracy or relevance for the purpose used	3.1 evaluate the authority and reliability of electronic sources  3.2 evaluate the relevance of electronically accessed information to a particular topic	4.1 assess the authority, reliability and validity of electronically accessed information  4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic

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## *Inquiry, Decision Making and Problem Solving*

### 14. Students will use organizational processes and tools to manage inquiry.

Division 1	Division 2	Division 3	Division 4
The student will be able to		The student will be able to	The student will be able to
1.1 follow a plan to complete an inquiry	2.1 design and follow a plan (including a schedule) to be used during an inquiry process, and make revisions to the plan as necessary	3.1 create a plan for an inquiry that includes consideration of time management	4.1 use calendars, time management or project management software to assist in conducting an inquiry
1.2 formulate new questions as research progresses	2.2 organize information, using tools such as a database, spreadsheet or electronic webbing	3.2 develop a process to manage volumes of information that can be available through electronic sources	
1.3 organize information from more than one source	2.3 reflect on and describe the processes involved in completing a project	3.3 demonstrate the advanced search skills necessary to limit the number of hits desired for online and offline databases; for example, the use of "and" or "or" between search topics and the choice of appropriate search engines for the topic	

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## *Inquiry, Decision Making and Problem Solving*

### 15. Students will use technology to aid collaboration during inquiry.

Division 1	Division 2	Division 3	Division 4
<p>The student will be able to</p> <p>1.1 share information collected from electronic sources to add to a group task</p>	<p>The student will be able to</p> <p>2.1 retrieve data from available storage devices such as a shared folder to which a group has contributed</p> <p>2.2 record group brainstorming, planning and sharing of ideas by using technology</p> <p>2.3 extend the scope of a project beyond classroom collaboration by using communication technologies such as the telephone and e-mail</p>	<p>The student will be able to</p> <p>3.1 access, retrieve and share information from electronic sources such as common files</p> <p>3.2 use networks to brainstorm, plan and share ideas with group members</p>	<p>The student will be able to</p> <p>4.1 use telecommunications to pose critical questions to experts</p> <p>4.2 participate in a variety of electronic group formats</p>

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## *Inquiry, Decision Making and Problem Solving*

I16. Students will use technology to investigate and/or solve problems.

<b>Division 1</b> The student will be able to	<b>Division 2</b> The student will be able to	<b>Division 3</b> The student will be able to	<b>Division 4</b> The student will be able to
1.1 identify a problem within a defined context 1.2 use technology to organize and display data in a problem-solving context 1.3 use technology to support and present conclusions	2.1 select and use technology to assist in problem solving 2.2 use data gathered from a variety of electronic sources to address identified problems 2.3 use graphic organizers such as mind mapping/webbing, flow charting and outlining to present connections among ideas and information in a problem-solving environment 2.4 solve problems using numerical operations and tools such as calculators and spreadsheets 2.5 solve problems requiring the sorting, organizing, classifying and extending of data using tools such as calculators, spreadsheets, databases or hypertext technology 2.6 solve issue-related problems using communication tools such as a word processor or e-mail to involve others in the process	3.1 articulate clearly a plan of action to use technology to solve a problem 3.2 identify the appropriate materials and tools to use in order to accomplish a plan of action 3.3 evaluate choices and the progress in problem solving, then redefine the plan of action as appropriate 3.4 pose and test solutions to problems by using computer applications such as computer-assisted design or simulation/modelling software 3.5 create a simulation or a model by using technology that permits the making of inferences	4.1 investigate and solve problems of prediction, calculation and inference 4.2 investigate and solve problems of organization and manipulation of information 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process 4.5 use programming tools such as macros, scripts and applets to modify or control a technological device 4.6 evaluate the appropriateness of the technology used to investigate or solve a problem
			2.7 generate alternative solutions to problems by using technology to facilitate the process

## *Inquiry, Decision Making and Problem Solving*

### **I7. Students will use electronic research techniques to construct personal knowledge and meaning.**

Division 1	Division 2	Division 3	Division 4
	The student will be able to	The student will be able to	The student will be able to
1.1 develop questions that reflect a personal information need	2.1 use a variety of technologies to organize and synthesize researched information	3.1 identify patterns in organized information	4.1 use appropriate strategies to locate information to meet personal needs
1.2 summarize data by picking key words from gathered information and by using jottings, point form or retelling	2.2 use selected presentation tools to demonstrate connections among various pieces of information	3.2 make connections among related, organized data, and assemble various pieces into a unified message	4.2 analyze and synthesize information to determine patterns and links among ideas
1.3 draw conclusions from organized information			4.3 use appropriate presentation software to demonstrate personal understandings
1.4 make predictions based on organized information			

## GLOSSARY OF TERMS

<b>Algorithm</b>	Sequence of steps for solving a problem.
<b>Alignment</b>	Specifying how text is aligned with the margins of the page. Most word processors support left alignment, center alignment, right alignment and justified alignment (each line of the paragraph is aligned with both the left and right margins).
<b>Analog</b>	Used to describe a continuous variable signal, as opposed to a discrete or "digital" one, or a circuit designed to handle such signals.
<b>Analog communication</b>	Any system that uses a nominally continuous signal.
<b>Analog data</b>	The representation of information in a way that bears an exact relationship to the original information, so that it varies continuously rather than discretely, as digital data does.
<b>Asynchronous communication</b>	Not happening at the same time. E-mail is an asynchronous form of communication.
<b>Bookmark</b>	A feature found in Web browsers that allows users to keep track of sites to which they wish to return.
<b>Browser</b>	A program used to make what is on the Web readable.
<b>Chart</b>	A graphic or diagram that displays data or the relationships between sets of data in pictorial rather than numeric form.
<b>Chat</b>	Synchronous, line-by-line communication over a network.
<b>Communication technology</b>	Concerned with the tools and processes used to transmit data from one device to another.
<b>Convert files</b>	To change the representation of data in either form or recording medium. To move data from one type of storage to another, such as from CD-ROM to floppy disk.
<b>Copy</b>	A word-processing function that lets a user copy text from one place to another in documents or between documents.
<b>CTS</b>	Career and Technology Studies
<b>Cursor</b>	A flashing box or line indicating the place on the screen where the computer user is working.
<b>Cut</b>	To remove text from a document; it may then be placed elsewhere.
<b>Database</b>	An integrated collection of data that supplies information in a variety of forms or for a variety of applications.
<b>Digital</b>	Relating to data that is represented in the form of discrete digits, as opposed to analog or continuous representation.
<b>Digital communication</b>	Any communication system that uses digital signals in the sending and receiving of messages.
<b>Digital information</b>	Information represented by discrete values, as opposed to analog data, which is represented in continuous form.
<b>Directory</b>	A special kind of file used to organize other files into a hierarchical structure. Directories contain bookkeeping information about files that are, figuratively speaking, beneath them.

<b>Document</b>	A record containing information readable by a person or a machine.
<b>Download</b>	The process of transferring a computer file from one computer to another.
<b>Electronic bulletin board</b>	An electronic message centre. Most bulletin boards serve specific interest groups. They allow an individual to review messages left by others and leave a message if desired.
<b>E-mail</b>	Electronic mail, a service that permits users to electronically exchange messages. E-mail can be used to send text as well as computer files, such as word-processing documents or graphics.
<b>Ergonomics</b>	The study of physical and mental factors that affect people in work settings; used in the design of work sites, work processes, and so on; e.g., the design of computer work stations so that users will have minimal strain on posture and vision.
<b>File</b>	A collection of items with certain common aspects, organized for a specific purpose and stored or processed as a unit.
<b>Flow-chart</b>	A diagram that shows the steps involved in solving a problem.
<b>Font</b>	The complete assortment of characters for one style and size of a particular typeface.
<b>Grammar checker</b>	A feature for checking the grammatical soundness of text, either as it is being keyboarded or later, at the user's discretion.
<b>Graphic</b>	A pictorial form of information.
<b>Hit</b>	An individual access of a particular web site — as in, "Our site had 725 hits this month."
<b>Home row</b>	The row of keys on the keyboard where users rest their fingers between keystrokes.
<b>Hyperlink</b>	On Web pages, a highlighted bit of text that, when selected, jumps the reader to another location.
<b>Hypertext</b>	Text that contains links to other text documents.
<b>Icon</b>	A picture displayed on a computer screen; used to represent a computer function.
<b>Information technology</b>	The broad subject concerned with the processes and tools used to send, retrieve, store, manipulate and manage information.
<b>Internet</b>	A worldwide network of computer networks.
<b>Intranet</b>	A collection of private Web sites that are available only to employees, or other trusted parties, within an organization.
<b>LAN</b>	A Local Area Network. A computer network usually confined to a single office or building.
<b>Laser disk</b>	A mass storage device that can store digital or video information.
<b>Login</b>	A username, for gaining access to a system.
<b>Logout</b>	To end a computer session.
<b>Mail merge</b>	A function that lets users merge information from a database into letters written on a word processor.
<b>Mass media</b>	Any means of public communication reaching a large audience.

<b>Menu</b>	A list of options for a person using a piece of software.
<b>Mind mapping</b>	A knowledge organization tool used to elicit ideas from one or more users by placing a topic in the center of a blank space and branching out with related ideas.
<b>Multimedia</b>	Use of text, graphics, video, animation, sound, etc., in an integrated way.
<b>Navigate</b>	Any or all of the various processes used in determining position and differing movement from one place to another.
<b>Network</b>	A linked set of computers and computer equipment.
<b>Network etiquette</b>	The traditional rules of civilized behaviour online.
<b>Newsgroups</b>	Online discussion forums where ideas and information can be exchanged.
<b>Offline</b>	Not currently connected to a network.
<b>Online database</b>	A database that is accessible to many users.
<b>Paste</b>	To insert a copy at an insertion point.
<b>Peripheral</b>	Any device, including input/output devices, that is connected to a computer.
<b>Platform</b>	A type of computer or system.
<b>Printer</b>	An output device that converts the coded information from the processor into a readable form on paper.
<b>Program</b>	List of instructions for the computer.
<b>Public domain</b>	Not bearing copyright; any product in public domain can be freely exchanged and copied.
<b>Retrieve</b>	To extract data from a file or files.
<b>Scanner</b>	A device that can capture an image and convert it into a unique set of electrical signals. The image scanned may be a pattern that is directly related to a code, such as bar codes on retailed products, or it may be a picture, page or portion of text.
<b>Searchpath</b>	Description of how to find a subdirectory or file by identifying its location with respect to a disk or drive's root directories.
<b>Simulate</b>	A computer application used to study the possible results of a process or strategy.
<b>Software</b>	A computer's list of instructions.
<b>Spell checker</b>	Software that checks the spelling of all words in a document.
<b>Spreadsheet</b>	A software calculating tool that helps people plan and manage data and present results.
<b>Storage device</b>	A device that can receive data and retain it for subsequent retrieval.
<b>Storyboard</b>	A board or panel containing a series of small drawings or sketches that roughly depict the sequence of action for a script to be filmed, as for a motion picture, television commercial, music video, or the like.
<b>Style</b>	A collection of formatting information that can be applied quickly to selected text. Some software supports both character styles and paragraph styles.

<b>Synchronous</b>	Occurring at regular intervals and at the same time. The opposite of synchronous is asynchronous. Most communication between computers and devices is asynchronous — it can occur at any time and at irregular intervals.
<b>Technology</b>	The processes, tools and techniques that alter human activity. The application of scientific knowledge for practical purposes; the employment of tools, machines, materials and processes to do work, produce goods, perform services or carry out other useful activities.
<b>Telecommunication</b>	Any process or group of processes that allows for the relay of printed or written matter, moving or fixed pictures, or other visible or audible signals.
<b>Text</b>	In word processing, the portion of a file that will be readable on a screen or printed page, sometimes including incidentals such as headers.
<b>Trigger</b>	A button on a mouse or joystick.
<b>URL</b>	A Uniform Resource Locator. A Web address. It consists of a protocol, a hostname, a port (optional), a directory, and a file name (optional).
<b>Upload</b>	The process of transferring a computer file from a user's system to a remote system.
<b>WAN</b>	A Wide Area Network. A computer network spanning a wide geographical area.
<b>Web page</b>	A hypertext document on the Web.
<b>Window</b>	A rectangular area on a display screen inside of which part of an image or file is displayed. A windows system is a means of presenting users with views of the state of a number of separate processes, each carrying out a task for the user. The user is able to initiate, monitor and terminate processes, each process having an associated window.
<b>Word processing</b>	A computer software writing tool.
<b>World Wide Web</b>	A collection of hypertext documents and associated files, linked together, that spans the Internet, and hence, the globe.

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OF GLOSSARY

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